

# ANNALS OF NATURAL HISTORY.

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XXIII.—*On a Shell-bank in the Irish Sea, considered Zoologically and Geologically.* By EDWARD FORBES, Esq.

FOR the last seven years I have been in the habit of dredging on a scallop bank which lies about five miles off the coast of Ballaugh on the north-western side of the Isle of Man. My observations have generally been made in autumn, and have been regularly recorded as soon as the contents of the dredge had undergone examination. The number of species and the number of specimens, dead and living, were duly noted down; always of the mollusca, and generally of the zoophytes and radiata. The want of a sufficient acquaintance with the crustacea and annelides has prevented my keeping any memorial of the numbers caught: the specimens were however generally preserved. From this bank I have obtained many new and rare animals, descriptions of some of which have been published. The observing of such, however, was not the only object in view, but also the observing the manner in which the various species there living are associated together, and the changes which their habitat undergoes from time to time,—points in zoology especially useful to the geologist. The results, so far, of my researches in this interesting locality, I propose in this paper briefly to communicate.

The bank, properly so called, is about twenty fathoms below the surface of the sea, and is thickly covered with scallops (*Pecten opercularis*), among which the common Oyster, the *Pecten maximus* and *P. varius*, and many other shells are found in smaller numbers. The ground at the edge of the bank is gravelly, with few scallops, but many univalve shells, such as *Murex erinaceus*, *Trochus zizyphinus*, and *Natica Alderi*. Between the bank and the shore, but nearer the latter, is a great tract of fifteen fathoms and under in depth, where great quantities of *Laminaria* and other marine plants grow, and which is covered with stones of considerable size, similar

to those which lie at low water on the shore, rolled masses of porphyry, syenite, granite, slate, and limestone. The neighbouring coast is sandy and marly, being in fact the edge, seawards, of a great tract of Pleistocene strata, forming the northern part of the island. The testaceous mollusca always abundant on the bank and on its edge are the following :

Pecten opercularis.	Buccinum undatum.
— distortus.	Trochus zizyphinus.
Modiola vulgaris.	— tumidus.
Hiatella rugosa.	Nassa macula.
Chiton cinereus.	Emarginula fissura.

Lottia pulchella.

All the above are constantly taken alive in great numbers, and dead specimens of them are also plentiful. The *Buccinum undatum* is generally of a large size, and almost always the variety called *striatum* by Pennant. Almost equally common now with *Emarginula fissura* is *Fissurella græca*, but this was not the case five years ago. They appeared suddenly on the bank in considerable numbers and of a good size. I have never taken but one young specimen (in which state it is *Patella apertura* of Montagu) though continually on the look out for them.

On the neighbouring shore I have observed a similar case of a species appearing, which was not found there formerly. Four years ago I picked up two specimens, very much seaworn, of *Lottia testudinalis*, on the shore at Ballaugh. At that time no living specimens of the species were to be found on our coast. Last year, however, to my surprise I found great numbers of very young *Lottie* under stones at low water. The year before I had taken a single full-grown example at a low spring tide, the first Manx living specimen I had ever found. This year (1839) the species is abundant; three or four under every stone at low water mark, well-grown, but not so large as the specimens common in Arran and the Hebrides. What is the cause of this sudden appearance of a species? Are the tides, or storms, or the locomotive powers of the molluscs themselves the means of transportation? Mollusca are much more active animals than is commonly supposed; and the smallest testacea, both bivalve and univalve,

delight in swimming. The naked mollusca of the genus *Eolida* swim with considerable rapidity, and are continually moving about when in their native element. Those who judge of these animals from seeing them on or under a stone at low water can form but a slight idea either of their beauty or habits. There is another instance of the variable appearance of a mollusc which I would mention. The spines of *Spatangus purpureus* (abundant on the bank) are some years covered with the parasitic *Montacuta substriata*, and at other seasons quite clear.

The following species are always found on the bank, and occasionally in considerable numbers :

<i>Fusus antiquus</i> .	<i>Venus cassina</i> .
— corneus.	— fasciata.
— Bamfius.	— virginea.
<i>Nucula margaritacea</i> .	<i>Kellia suborbicularis</i> .
<i>Pectunculus pilosus</i> .	<i>Velutina lævigata</i> .

The *Fusus antiquus* is the small form of that shell called *Fusus norvegicus* by some authors. It seems confined to certain spots on the bank. Most univalve shells of the siphonostomatous tribes are gregarious and plentiful in confined localities. Most of the above-mentioned species are gregarious, both univalve and bivalve. It is remarkable that young specimens of *Venus cassina* and *fasciata* rarely occur, and when found are almost always dead shells, whilst of *Venus virginea* the only living specimens taken are young ones. In the latter case it may be accounted for by supposing that *Venus virginea*, being a borer in mud, buries itself deeper when full-grown than when young. *Kellia suborbicularis* lives in little families of all ages in the mud-filled cavities of dead *Venus virginea*. Along with it is occasionally associated *Amphidesma tenue*.

Always found on the bank, though never in great numbers, are the following :

<i>Ostræa edulis</i> .	<i>Murex erinaceus</i> .
<i>Pecten maximus</i> .	<i>Capulus hungaricus</i> .
<i>Lima fragilis</i> .	<i>Natica Alderi</i> .
<i>Pecten obsoletus</i> .	<i>Venus exoleta</i> .
<i>Cardium lævigatum</i> .	— ovata,
<i>Psammobia tellinella</i> .	<i>Mya truncata</i> .

The oysters are few, very large, muscular, and thick-shelled. I have rarely seen a half-grown oyster on this bank, and never a very young one. They seem to be the aged survivors of some former colony. Many of the shells are dead. Those of the living are generally perforated by that singular zoophyte the *Cliona*. Oyster shells, when they die, do not generally separate valve from valve: Venuses also remain in general with the hinge perfect: but *Tellinæ* and *Psammobiæ*, as well as *Pectens*, go to pieces. *Cardium lævigatum* is often found double, fresh-looking, of a large size, but always dead. The one or two young specimens (*Cardium serratum* of British authors) I have taken have been alive. *Cardium elongatum* and *nodosum* occasionally occur, but also dead, and these two species rarely remain double after death. *Venus exoleta* is rarely taken alive here, but the specimens are fine, large, and double. Young shells very rarely occur. *Venus lineata* is occasionally found: on the opposite coast of the island it abounds. *Venus ovata* is generally living. *Mya truncata* is found only dead and old; the valves generally separate. I feel sure the *Mya Swainsoni* is only the young of this species, and not of *Mya arenaria* as some have supposed. Wherever *Mya truncata* is found, there *Mya Swainsoni* is found; and all gradations of form may be observed from *Mya Swainsoni* to *Mya truncata*, passing through the *Mya ovata* of Turton, which is the half-grown shell. Look on the beak of a *Mya truncata*, and you will find a little *Mya Swainsoni* included. The beak of bivalves tells many tales against supposititious species, and is not yet attended to as it ought to be.

Occasionally taken, and on the whole not uncommon, are

<i>Fusus muricatus.</i>	<i>Chiton lævis.</i>
<i>Trochus Montacuti.</i>	<i>Pecten varius.</i>
<i>Mactra elliptica.</i>	<i>Solen ensis.</i>
<i>Tellina crassa.</i>	<i>Amphidesma tenue.</i>

*Lucina undata* and *Radula*.

*Mactra elliptica* is generally dead, double and perforated: *Tellina crassa* and *Solen ensis* always dead; the former never double. *Pecten varius* occurs in considerable plenty some years, and at other times I do not find a single specimen.

The Chitons are never taken dead, probably falling to pieces after the animal's death. The Lucinæ are always dead.

Rare, but taken oftener than once, are

Trochus tenuis.	Chiton fuscatus.
Fusus linearis.	Lima inflata.
Natica Montaguï.	— tenera.
Rissoa reticulata.	Modiola marmorata.
Dentalium entalis.	Astarte scotica.
Chiton fascicularis.	— danmoniensis.

Modiola discors.

All these species are taken alive. The *Lima inflata* is always found in a very singular situation, imbedded in a mass of coralline fibres, broken shells and fragments of millepora. On breaking open the mass we find the *Lima* alive in the centre, in a neatly constructed nest, the sides regularly smoothed, somewhat resembling the bed of the *Modiola impacta* of the South seas. I am not aware that this very remarkable habit has ever been noticed. Neither *Lima fragilis* nor *Lima tenera* are found in similar nests. The two species of *Astarte* are found of nearly equal size, the characters of the margin distinct in each. I regard the thickening of the margin in many species of this genus as specific in the full-grown shell.

The following species have occurred only once. In the case of the three first, two specimens were taken of each, of the others one only.

Eulima Donovanï.	Pecten lævis.
Pleurotoma purpurea.	Criopus anomalus.
Arca tetragona.	Psammobia strigillata.

The two *Arceæ* were taken together, imbedded in the mud filling the cavity of a large dead *Modiola*. They were alive. The *Pecten* was attached to the stalk of a coralline. The *Psammobia* was a dead valve.

Naked mollusca are not uncommon on the bank, as might be expected, seeing that it is very fertile in specimens of *Antennularia antennina*, the favourite habitat of the smaller deep-water Nudibranchia. The most common is *Melibæa fragilis*. Formerly *Tritonia Hombergi* abounded of a very large size,

but during the last three years I have only taken as many specimens.

Animals of the class Echinodermata are abundant. Starfish of the family Asteriæ abound on the bank, those of the family Ophiuræ on its edge. Among gravel *Echinus subangularis* is common: among the scallops *Echinus esculentus*. *Spatangus cordatus* is very rare, while *Sp. purpureus* is very common, as also *Echinocyamus pusillus*. *Holothuriæ* are extremely scarce, two species only having been found, and but one specimen of each.

Among the zoophytes, of late *Plumularia myriophyllum* has become common; and this year I have taken twenty specimens of the rare *Thuiaria articulata*, which I never observed in our sea before. Every dredging excursion I make I add to our local list of zoophytes and naked mollusca, but seldom now find a testaceous mollusk new to the district. The inhabitants of this bank belonging to the classes Mollusca, Echinodermata and Zoophytes, may be summed up as follows:

MOLLUSCA.....	Univalve Testacea .....	27
	Bivalve Testacea .....	44
	Nudibranchia .....	9
	Naked Acephala .....	4
		—84
ECHINODERMATA ..	Asteriadæ .....	14
	Echinidæ .....	5
	Holothuriadæ .....	2
		—21
ZOOPHYTES .....	Hydroiada .....	11
	Asteroida .....	1
	Helianthoida .....	2
	Ascidioida .....	14
		—28

I shall now, before concluding, notice a few points wherein this review of the Ballaugh scallop-bank may be made to bear on Geology.

Supposing the bank converted into a fossil bed similar to the shell-marls of the Pleistocene or newer Pliocene æra, let us see what effect such change would have on the Fauna.

1. We should be able to form a pretty accurate idea of the testaceous mollusca inhabiting it, but not of the naked mollusca, as the latter would wholly disappear.

2. The relative proportions of univalve and bivalve testacea met with would depend on the part of the bed examined, whether its centre or its edge.

3. The Chitons would scarcely be met with in consequence of their fragility and disorganization after death, though abundant on the bed in a living state.

4. It is probable that a greater number of species would be met with in the fossil than in the recent bed, since the rarity of certain species would seem rather to depend on the paucity of individuals than on other causes; and as the probability of meeting such would depend on the extent of surface examined, the inspection of a bed of shells high and dry would be more likely to reward our researches than an examination conducted in the deep sea by means of the dredge, which must always be partial.

5. Of the Echinodermata we should probably find the remains of sea urchins only; and as they generally fall in pieces like the Chitons, we should be obliged to determine the species from fragments. I may mention that I find good specific characters in the *spines alone* of our native living species, and no doubt such is also the case with the fossil.

6. Of Zoophytes we should find only the remains of a few species (having calcareous polypidoms) belonging to the order *Ascidioidea*. The greater number would probably altogether disappear.

7. The larger Crustacea being very few, and the smaller very small and fragile, or else unpreservable in such circumstances, though very numerous living, we should find but few traces of the presence of the tribe.

8. The testaceous Annelides would remain, the soft tribes altogether disappearing.

I have drawn up these observations chiefly in the hope of inducing others to present us with similar reviews of the shell-banks of our coast. Geology and zoology will gain as much by inquiring how our marine animals are associated together as by investigating genera and species, though the former subject has as yet been but little attended to in comparison with the latter.